An Electronic medical record system to support HIV treatment in rural Haiti

[1]Darius Jazayeri MEng, [1,2]Paul Farmer MD PhD, [2]Patrice Nevil BS, [1,2]Joia S Mukherjee MD MPH, [2]Fernet Leandre, MD [1,2,3]Hamish SF Fraser MBChB MSc,
[1]*Program in Infectious Disease and Social Change, Dept. of Social Medicine, Harvard Medical School, Boston, MA,* [2]*Zamni Lasante, Cange, Haiti,* [3]*Informatics Program, Childrens Hospital, Boston, MA*

Background

HIV-AIDS has become the world's leading infectious cause of adult deaths. Approximately 5% of Haiti's adult population is infected with HIV, making it the most affected nation in the western hemisphere[1]. The non-governmental organization Zanmi Lasante (ZL) launched an innovative program 5 years ago to treat HIV patients in the very impoverished central plateau with highly active anti-retroviral therapy (HAART)[1]. ZL currently follows more than 4000 HIV-positive patients, over 10% of whom are already on HAART, and was recently awarded funds from the Haitian grant from the Global Fund to fight AIDS, Tuberculosis and Malaria. Expanding treatment in a region with few doctors and virtually no roads, electricity, or electronic communication is a major challenge requiring careful coordination of clinical care, investigations and drug supplies. We describe a prototype Electronic Medical Record system to support treatment of HIV and tuberculosis in remote and impoverished areas.

Design Considerations

Treatment of HIV requires daily administration of three anti-retroviral drugs (ARVs) plus supplementary medicines, as well as careful monitoring of clinical progression, development of side-effects, and lab results. HAART is more expensive than other essential drugs and must be given daily to maintain control of the disease and minimize resistance. ZL runs a central clinic housing the laboratory and main warehouse, and 5 smaller clinics. The project requires a system to communicate test results from the central lab to the satellite clinics, and most importantly to monitor inventory and predict future requirements of ARV drugs. The only electronic communications between sites are satellite Internet connections set up by ZL. (Bandwidth is reasonable, but power outages and lightning storms commonly interrupt service.).

Current Progress

We have built a system with three components:
(1) a secure, central web-based medical record system that records data on general clinical status, laboratory results, current and previous medications, and followup visits, based on the technology used for a web-based tuberculosis EMR in Peru[2]. We use an Oracle database with free software: Linux, Apache web server, and the Tomcat Java Servlet engine.
(2) an offline application which allows the entry of clinical data from remote sites when the internet is unavailable, and uploads the data when connectivity is restored. It is configured by XML descriptor files to replicate the web interface, and built using Java.
(3) a drug inventory system modeled after traditional stock cards, which records stock levels and transactions at different sites. It is accessible via the web, and is linked to patient regimens in the EMR. It displays current inventories in the warehouse and provides warnings if these drop below specified values.
The EMR allows physicians to order medicines and lab tests, and provides alerts based on clinical status and test results. It is operational and patient records are currently being entered.

Future Plans

Over the next five years the project will be scaled up to treat several thousand patients. The offline application is being extended to store up-to-date patient summaries, to allow physicians to review cases when the network is down. Although the system has been developed for clinical care and program management, it is also useful for clinical and operational research.

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References

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